

Shaping the Future now – Good Start!

*International evaluation of Geo Life Region,
Smart Housing Småland and The Paper Province 2.0*

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LISA DE PROPRIIS, MARKKU SOTARAUTA, PETER A HECKER, ROYA AYAZI,
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MARIT THUNBERG WERNER – VINNOVA (ED.)



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2016 map of the Vinnväxt-programme initiatives

Preface

In this evaluation report Vinnova (Swedish Governmental Agency for Innovation Systems) presents the first evaluation of the initiatives in the fourth announcement of the Vinnväxt-programme. The initiatives were selected through a call in two steps; first a planning phase where eleven applications were approved and a second phase where the winners were announced. In May 2013 the programme council and the assessment panel (10 experts), plus officials and experts from Vinnova, selected the three Vinnväxt winners; Geo Life Region, Smart Housing Småland and The Paper Province 2.0.

The objective of the Vinnväxt-programme is to promote sustainable growth based on international competitiveness in regions. This is done by developing regional innovation system's functionality, dynamics and efficiency to an international level. According to the evaluation strategy the initiatives are evaluated every third year. This midterm evaluation had both a summative and a formative/learning approach focusing on achieved results and strategic issues related to developing the initiatives further. The focus for the evaluation was the quality of implemented research and innovation/commercialisation strategies and results from an international comparison perspective. Other evaluation aspects was organisational and leadership issues as well as outcome and impact of the initiatives in terms of mobilising key actors and influence on the regional (and national) innovation systems. The evaluation panel also looked at the conditions established for the sustainability of the initiative after the financing through the Vinnväxt-programme.

The evaluation has been carried out through a group of international specialists from university and industry, both in cluster development and regional innovation systems and in the specific knowledge area for each initiative.

This report presents the evaluation of the following initiatives appointed as winners 2013:

- Geo Life Region
- Smart Housing Småland
- The Paper Province 2.0

After an introduction to the evaluation and the triple helix model, there will be a chapter for each of the three initiatives, one chapter about the wave of new technologies that will impact traditional manufacturing sectors (Smart Manufacturing), including most of the Vinnväxt-initiatives and a chapter with concluding remarks at the end.

Vinnova in December 2016

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1 Introduction

This report presents the evaluation of the Vinnväxt 2013 initiatives:

- Geo Life Region
- Smart Housing Småland
- The Paper Province 2.0

1.1 The Vinnväxt-programme

The Vinnväxt-programme aims to promote sustainable regional growth by developing internationally competitive research and innovation milieus in specific growth fields. Vinnväxt also wants to catalyse a broader trans-formational change in society, towards innovation-driven sustainable growth in the Swedish regions. This will be achieved by funding institutional development and needs-driven R&D to strengthen the cutting-edge competence of the various milieus. There will also be strategic efforts aimed at developing innovation systems.

The regional innovation systems supported through the Vinnväxt-programme have been selected through national calls for proposals and the winners are all believed to have excellent growth potential. Some 200 initiatives have applied for funding under Vinnväxt's five calls for proposals. Of these, 17 regions ("functional" regions) have been declared winners.

The objective is that the winners will develop regional, national and international links and networks with a "Triple Helix" base and build an attractive place for research-based innovation in their respective fields. A unique aspect of Vinnväxt is the long time horizon. Vinnova will provide the winners with funds of between 0.5 -1 million euros per year for 10 years.

1.2 The 2013 Vinnväxt-programme initiatives

1.2.1 Geo Life Region

The Geo Life initiative was established to utilize a unique set of regional resources, the most important being the National Land Survey, strong local and regional public service institutions and the extensive databases allowing novel experiments in the broad field of geographical information technology (GIS). The vision of Geo Life involves the use of new technologies to improve data collection and create new integrated GIS layers of data to better understand and support people's everyday life and health, and by that also creating more sustainable cities. Geo Life is about people in a society in which women and men possess extensive knowledge and skills. This knowledge together with spatial information will be important for developing livelihoods, values and welfare.

The Geo Life Region is coordinated by the Cluster organisation Future Position X, and will develop a new regional innovation system focused on the intersection of geospatial technologies, health and wellness and addresses the some grand challenges of the future.

1.2.2 Smart Housing Småland

The vision “Smart Housing Småland is an internationally leading innovation environment that, with a focus on the user, creates smart housing and a sustainable built environment on glass and wood” means that the initiative operates in the field of construction and housing. To achieve a unique position in the field is more difficult when there are many competitors. However, this also means, due to the breadth of what may be included in construction and housing, that there are many possible synergies with other operators, but also other areas of expertise. Higher demands for sustainable construction and housing shortage entail growth opportunities.

1.2.3 The Paper Province 2.0

The vision of The Paper Province 2.0 is to be a leading competence hub in forest bio-economy. The initiative is based on the present resources in the region, networks and proximity, human capital, trust between stakeholders, access to raw materials, production units and existing infrastructure. Collectively this constitutes a platform where forest based bio-economy will be demonstrated in practice; the region has the ambition to be a large-scale demonstrator of how to make a transition from fossil based to non- fossil, bio-based society.

1.3 Evaluation as a tool for learning and development

The initiatives in the Vinnväxt-programme will be evaluated every third year to determine whether they are complying with Vinnova’s requirements. In 2011, the first evaluation of the 2008 initiatives focused on the process of organising and establishing the innovation system and the results to date when it comes to knowledge development, innovation and commercialisation.

This midterm evaluation had both a summative and a formative/learning approach focusing on achieved results and strategic issues related to developing the initiatives further. The focus for the evaluation was:

- The quality of implemented research and innovation/commercialisation strategies and results, from an international comparison perspective
- The achievement of the initiatives when it comes to setting up the organisation, the processes and mobilising key actors that embody the platform for future growth and international positioning in their respective growth area
- The influence on the regional (and national) innovation system
- The conditions established for the sustainability of the initiative after the financing through the Vinnväxt-programme.

The evaluation should be seen as a learning process and input for the strategic development of the initiatives and the action plan for the coming three years. The evaluation is one activity of the learning strategy that adds value for the Vinnväxt-programme.

1.4 The evaluation team and the task

The evaluation was carried out by international experts in a peer review. The evaluation team consisted of:

- Peers with generalist expertise in innovation systems and cluster development

- Peers with specialist expertise in knowledge development, innovation and commercialisation in the specific field for the initiative.

The evaluators are presented in the matrix below. For background on each of the evaluators/experts, see Appendix.

Table 1. The evaluators

NAME	EXPERTISE	GEO LIFE REGION	SMART HOUSING SMÅLAND	THE PAPER PROVINCE 2.0
LISA DE PROPRIIS	Innovation systems & cluster development	X	X	X
MARKKU SOTARAUTA	Leadership, innovation systems & cluster development	X	X	X
ROYA AYAZI	Research & technology	X		
PETER A HECKER	Research & technology	X		
BERIT TINE	Research & technology		X	
JAN BELIS	Research & technology		X	
TIINA PURSOLA	Research & technology			X
JACK SADDLER	Research & technology			X

The evaluation team had a detailed schedule for the visit at the respective initiative, but in general the activities to be performed by the evaluation team were:

- Reading of background material
- Panel review – Interviews with the three winners
- Feedback meeting
- Interviews with Vinnväxt Management team if necessary (Generalist competence experts)
- Feedback to Vinnova Management
- Writing and delivering a final report

1.5 The evaluation process

1.5.1 Site visit

The evaluation was based on a site visit to each of the three initiatives with the following general agenda:

Table 2. The programme for a site visit

DAY	ACTIVITIES
0 (EVENING)	Evening meeting with peer team to plan work and create team
1	Meetings at site with stakeholders in the initiative
2	AM: Workshop for peer team – conclusions, recommendations and synopsis for report for the peer review of each initiative PM: Feedback meeting with the initiative

1.5.2 Background material: A Status Report prepared by the Vinnväxt initiatives

The initiatives prepared a Status Report covering the period of activity from 1/7/13 - 30/3/16. The report included a self-assessment report, a summary, an annual report, an income and expenditure account and a strategy for the coming three-year period. Furthermore, Vinnova provided the evaluators with a summary of quantitative results covering the period 2013-2016. These documents worked as background information for the peers.

Self-assessment means here the initiative's reflections in an annual report on the fulfilment of objectives, based on the results achieved and relative to the action plan agreed for the period. Self-assessment also entails describing how important events influenced the development of the initiative, both positively and negatively.

2 Triple Helix

Innovation processes are place-based and systemic involving businesses and public research organisations as well as engaged local and regional institutional stakeholders. It was Etzkowitz and Leydesdorff (1995, 2000) who developed the triple helix model of innovation where innovation dynamics are propelled by constant interactions between university, business and government. Rather than knowledge creation being closed inside firms and top down, it is open, systemic and dynamic in the triple helix model. Core to this model is the fact that each stakeholder not only interfaces with the other two within regional innovation systems (Cooke, 2001), but assumes some of the functions of the other stakeholders in view of creating a permeable innovation systems where learning, knowledge and expertise are shared.

In relation to innovation and learning, geographical proximity is important but not closely necessary: technological upgrading and path-changing strategies require regional innovation systems to identify outwards channels through which new technologies and competences can flow in. This is particularly true for traditional industries very locally embedded seeking industrial renewal. The concepts of related variety suggests that regions can benefit from having a mix of sectors that are technologically connected for the gradual renewal of sectors and the longer term resilience of regions (Asheim, Boschma & Cooke, 2011; Frenkel, Van Oort & Verburg, 2007). However, at times of radical technological change, the close proximity of technologically distant technologies can generate radically new economic spaces thanks to the adoption of bridging technology (Corradini and De Propris, 2016) and the presence of unrelated varieties (Boschma, 2015).

The complexity of industry requires constant new knowledge (through human capital, collaboration, research hubs), in particular, “knowledge flows can- and often do- take place between industries with very different degrees of R&D intensity and different knowledge base characteristics” (Frenkel, Van Oort & Verburg (2007) and Asheim et al (2011); Asheim, 2011:899). This is particularly true as the current techno-economic paradigm is shifting due to the technological changes that are brought in by the so called 4th Industrial Revolution (De Propris, 2016).

3 Geo Life Region (GLR)



Geo Life Region (Cluster Excellence Gold). Photo: Geo Life region

3.1 The initiative

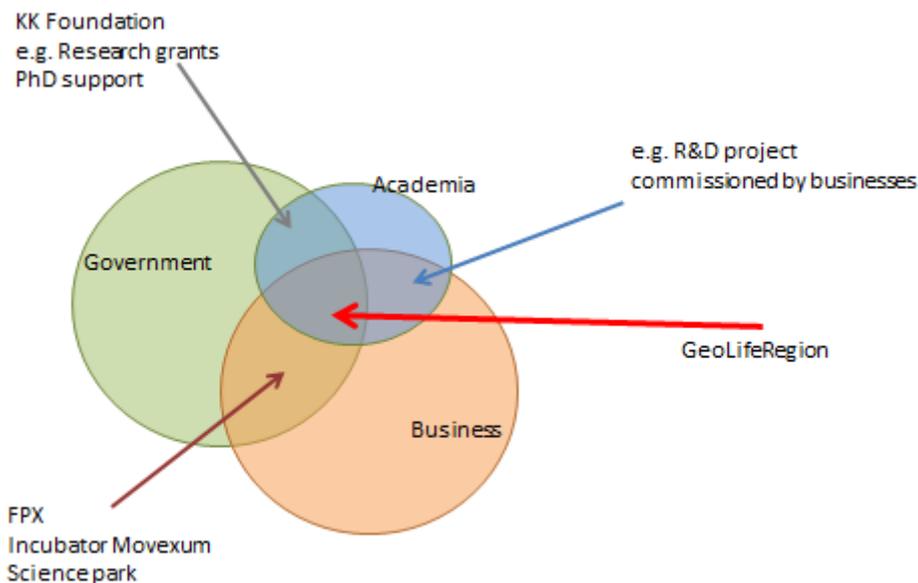
The vision of Geo Life Region (GLR) is that the city of Gävle is known as the capital of Geographic Information System (GIS) in Europe and also becoming an internationally known place for implementing geo-technologies for public health and wellbeing. The region is a place where, based on a deep understanding of human behaviors, new instruments, sensors and new methods to manage and comprehend/interpret information is developed in cross-sectoral, dynamic innovation processes.

The Gävleborg region is driving a transition from ‘old industries and specialisations’ to ‘new industries’ connected to the EU digital agenda and exploiting the recent technological advancement in digital technologies and ICT. In parallel, such new industries require and allow for greater entrepreneurship than before. This is however a major cultural challenge for a region where generation after generation only large firms offered job prospects as employees.

3.2 Achievements and strengths

The evaluation panel appreciated the progress made by the Geo Life Region (GLR) initiative since its start. Indeed, the GLR initiative presents a number of strengths. Firstly, FPX demonstrates well organised management structure and stakeholder community. It benefits from a strong and committed regional support network and access to local and regional government officials appears to be easy. The initiative seems to have a strong position regionally and local stakeholders believe it plays an important role in the region’s diversification strategy for longer term growth and jobs. Relatedly, it has formulated a well-defined and clear strategy. Secondly, the Initiative has a unique access to datasets and contacts thanks to the co-location with the Land Registry Office that provide an excellent stepping stone to build a Centre of excellence on GIS and more ambitiously on geo-space technology. Success stories were shown demonstrating an ability to identify opportunities and to translate ideas in products. Thirdly, the Initiative seems to present fairly well developed triple helix with businesses, regional stakeholders and academia, all committed and engaged.

Figure 1. Triple Helix in Geo Life Region



3.3 Challenges and weaknesses

The GLR initiative is based on a close collaboration between the universities, the government and businesses. Although the Initiative has successfully mobilised actors across these three institutional spheres, the commitment of the local university has been dependent on individual contributions rather than an institutional support from the leadership of the university. Of course, being a teaching intensive university the University of Gävle has its limits in supporting a focused initiative like GLR. Additionally, one of the constraints the well-being and health oriented GLR initiative faces is the weak healthcare research and industry base in the region. The Initiative has been compensating this and other constraints with extensive networking both internationally and nationally. However, in spite of extensive international networking, the GLR Initiative has not as actively sought partners from other European countries, or aimed at securing funding from the European sources.

As a traditional industrial region Gävleborg suffers, as do many of its peers, from a low level of entrepreneurial activity. Its capacity to discover profitable opportunities presented by the unique resources available in the region are thus not yet maximally exploited. There also is a need to work to improve competences related to venture finance. It is generally acknowledged that a well-functioning innovation ecosystem requires competent venture financiers, who recognize the most prominent companies and teams, finance them, bring added value to their management (networks, competencies, etc.), and thereby enable companies and teams to capture the underlying value of their businesses. Relatedly, the Gävleborg region suffers from a skills gap between traditional offerings and new opportunities, and if this constraint is not being adequately dealt with, it would present one of the major bottlenecks. For its part, an increased emphasis on entrepreneurship and venture finances might in the long run narrow the skills gap.

Furthermore, the evaluation team considered the extensive network with the Chinese partners as a clear asset that, however, may turn out to be a threat if overemphasised in relation to European

partners. The evaluation team considered this issue carefully and concluded that a balanced international network with best possible regional, national and international partners serves the Initiative's best interest.

As the GLR Initiative is clearly characterised by high hopes and enthusiasm in the region, a variety of expectations is emerging. In the early stages of the Initiative, earlier scattered resources and expertise has been pooled around a shared vision but, presumably, as the activities continue to expand, there is a danger that the different expectations of various actors begin diverging, which again might lead to a dissipating project portfolio. Dissipating project portfolio might lead to a situation where the key actors would not be able to agree on the most important projects and activities that again might jeopardize the well-functioning regional Triple helix constellation.

3.4 Opportunities

The GLR Initiative was established to utilise a unique set of regional resources the most important being the National Land Survey, strong local and regional public service institutions and the extensive databases allowing novel experiments in the broad field of geographical information technology. All this allows the GLR Initiative to explore and exploit almost endless set of opportunities emerging from the increasing individual level health consciousness emerging across the world, new health technologies and health systems being transformation under fiscal stress. The GLR Initiative is fairly well positioned to identify the emerging opportunities.

However, if not accessible to experimentation and new forms of collaboration, the very same resources that open up novel opportunities may turn out to be the main threat in further developments. It seems to be clear the GLR Initiative has made visible progress in tapping into the resources available but at the same time the evaluation team saw the core resources have only begun to open themselves for wider collaboration, and there is still much to be done. At all events, if the core resources remained only partly open but partly closed, the internationally impressive competitive advantage would be lost.

3.5 Recommendations

This report has praised the GLR Initiative's visible achievement, flagged up some crucial challenges that will need to be tackled in the coming years and presented a number of suggestions and ideas to be considered. The main recommendations include priorities that require relatively short term actions as well as issues worth starting planning for medium and longer term actions.

- **Strengthening local research capacity.** The research sector is crucial for the Initiative to succeed in its ambitions but simultaneously it is the weakest link in the innovation chain locally. Gävle University is rather a teaching university than a research university and therefore, the evaluation team recommends that, even though FPX maintains reliable contacts to well-known research institutes abroad, the regional aspect needs to be significantly strengthened. Easy access and admittance to research partners especially for small companies is very important for the activation and success of industry oriented R&D activities.

To foster the continuous development of innovative ideas a dedicated system of actions should be set up. For instance cascading workshops should be arranged: firstly some with a larger number of participants aimed at identifying broad R&D topics, and then subsequently smaller groups' workshops should be organised on specified topics with specific tasks and assignments. In each case the best fitting partners could be assorted. Finally, in very small groups of only two or three partners (SMEs and research) the original idea should be developed to become a complete R&D Project that includes also the procurement of the necessary funding.

The integration of regional research competence is lacking and regional in this context can also comprise Uppsala and Stockholm. This should be carefully evaluated in order to find the best complementary partners. However, overlapping of fields of research of the candidates to look at should not lead to their exclusion. Even in the research field competition is to some extent a helpful prerequisite.

- **Strengthening health-care research basis.** The GLR Initiative has set itself the goal of creating a pioneering connection between the branches of geographical information and the healthcare industry. The expertise of geoinformation technologies is present in the entrepreneurial cluster partners of GLR Initiative. However, the evaluation team was not able to recognize a comparable number of partners from the healthcare industry or health related fields of research. The engagement of the health-care sector needs to be strengthened.
- **Designing and implementing a clear EU related strategy.** In the GLR Initiative, international relations and activities are well developed. While they are outstanding towards Asia and the US, Europe seems to be less in the focus. As GLR might benefit from EU-activities and networks or learn from experiences of other EU-Member States, the evaluation team recommends the GLR Initiative to formulate a clearer EU-Strategy.
- **Developing customer co-created services.** The evaluation team recommends the GLR Initiative to establish a living lab to integrate academic research, real-life experimentation and the search for business opportunities even more systematically. The GLR Initiative is already carrying out several projects that in practice resemble living lab approach, and thus such a well-developed operational model as the living lab might provide the Initiative with additional food for thought and practical methods. There is no space to elaborate the living lab concept further, but as a real-life test and experimentation environment where users and producers co-create innovations in a trusted, open ecosystem that enables business innovation, it appears as a perfect match with the GLR Initiative's core values and thinking
- **Increase entrepreneurship in relation to Geo Health.** The lack of an entrepreneurial culture needs to be tackled by creating a fertile ground for new ideas to become business and by showing how it can happen. First of all, University's internships and industry placements should be added to undergraduate and postgraduate degrees to familiarise students to the business world, to give them business-like experience, contacts and 'employable skills'. Additionally, the university could encourage start-ups by designing joint degrees that have both business and science subjects. This will acquaint students who are into science to understand the basics of business, economics and finance, such as how to write a business plan, how to make informed decisions about finance. Equally important is to have incubation facilities and science parks attached to the university to promote university's spinoffs. Locally and easily through regional integrators such as GLR, it is very valuable to make some local successful entrepreneurs 'visible role models', they will galvanize new generations as well as provide advice and information. GLR could also play a more formal networking role and facilitate partners' match making, or coaching services.

4 Smart Housing Småland (SHS)



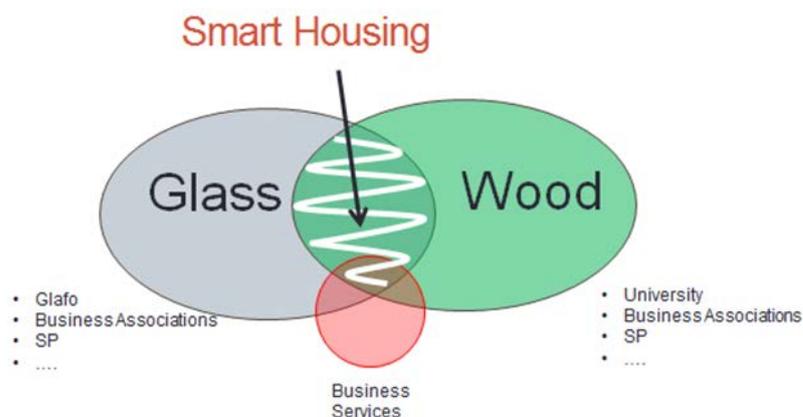
The international evaluation team of the 2013 Vinnväxt-programme initiative Smart Housing Småland. Photo: Elisabeth Flygt May 2016.

4.1 The Initiative

The vision of SHS is to become “an internationally leading innovation environment that creates smart housing and a sustainable built environment on glass and wood”. This marries with the aspiration of designing and building houses that are fundamentally sustainable whilst also being flexible and affordable to meet the demand of specific demand segments such as a private demand for large family accommodations, and a public housing for young people/students, elderly and refugees.

SHS is driving a process of regional renewal that aims at ferrying the Småland region from having an economy that produces timber for construction and flat glass for windows to one that is exploring combinations of these two materials for new and experimental socially and ecologically sustainable housing solutions.

Figure 2. The new sector addressed by Smart Housing Småland



4.2 Achievements and strengths

The evaluation panel recognizes that the Smart Housing Småland Initiative has made great progress since it was kicked off in 2013. SHS has been able to build a consensus across the key regional stakeholders that constitute the triple helix (academia, business and government) within the innovation system. The presence in the Småland area of three administrative regions, of two universities and of well rooted and long-established sectors such as glass and wood, make the achievements of the Initiative so far worth of merit. The regional stakeholders from the Jönköping, Kalmar and Kronoberg Counties are very committed to the Initiative and are genuinely trying to overcome administrative barriers that inevitably complicate their engagement. Indeed, SHS has successfully mobilised local businesses across the two key sectors, the two local universities and the local and regional authorities. These two factors together contribute to a crucial strength determining the success of the Initiative.

The SHS Initiative has been able to produce a prototype - House 1.0 – that is a visible product of a collaborative effort across a number of parties that came together to work on a shared project. This achievement is coupled with a large number of SHS funded projects, such as pre-studies, pilot studies or prototypes. The “seed money” was distributed regionally and touched on a very broad range of innovation areas.

In the late 2015 the Initiative underwent an internal re-organisational that involved a change of process leader and restructuring culminating in a new decision making structure and process finally agreed upon in March 2016. This must have been disruptive and to some extent distracting, but to the credit of the Initiative, the key stakeholders have been able to find another process leader and to restructure their organisation to create a more agile decision making, where there is a core of full time people wholly concentrated on the Initiative and two separate groups of stakeholders who advice, validate, and monitor the functioning of SHS from designing strategies to oversee decisions and implementation.

4.3 Challenges and weaknesses

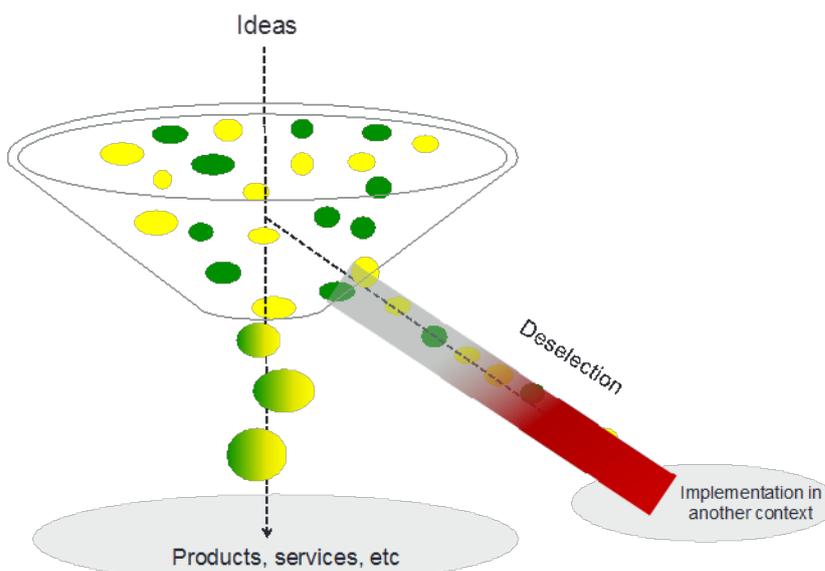
The innovation capacity of an innovation system model derives from the interplay between the three groups of stakeholders with the SHS Initiative being the beating heart of it in the middle. As indicated above, the Initiative has been able to create consensus and mobilise key actors. However, there still are some challenges related to the balance collaboration cross the three helices. Firstly, the business helix is unevenly involved, as some parts of the wood and glass sectors have engaged with the Initiative more than others. Relatedly, secondly, the leadership of the two Universities in Småland - Linnaeus University and Jönköping University – have shown a robust commitment to the Initiative but greater opportunities need to be seized at a more micro level through the engagement of faculty as well as researchers through Horizon 2020 applications, for instance, or expansion of the programmes aligned to SHS.

Thirdly, the Initiative lacks focus somewhat. This is understandable, as in the early stages, the Initiative has aimed at being as inclusive, exploratory and visible as possible to secure commitment and mobilisation. Indeed, as a result of both the prototype and the development opportunities for businesses has been to create a ‘feel good factor’ in the region around the Initiative, to strengthen the sense of self-confidence in the transformative function of the Initiative for the regional economy, and not least to ensure its visibility. However, there are few concerns that need to be dealt with before moving towards the next phase including international and national benchmarking and networking and setting strategic partnerships with selected innovation environments.

Fourthly, the SHS Initiative is using quite loosely fashionable key words being currently in wide European circulation, especially that of ‘smart’. From the collective action point of view, a shared understanding of the core concept is fundamentally important. It might prove useful in the efforts to prioritise the projects and pool the competences and knowledge around the key projects, as becoming more strategic calls for a good capacity to see beyond the ambitions of the three regions and individual organisations.

In sum, there is a need to (a) prioritize the development efforts further (simultaneously being open to new initiatives emerging from the network and markets); and (b) contain the project portfolio, which might imply some project being deselected because not close enough to the Initiative priorities. It goes without saying that dissipating project portfolio may in the long run hamper the reaching of the main goals, and becoming “the best in the world”.

Figure 3. Focus and selection is needed



4.4 Opportunities

Cities and more densely populated communities are growing all over the world. For these communities it is important to ensure optimal energy use and that they shall be good places for people to live and work. This requires continued and increased attention to environmental qualities, energy efficiency and flexibility, while simultaneously developing the quality of the housing/buildings and communities in which people spend their daily lives, but also by empowering citizens by effective ICT services and solutions for mobility. What follows is that land and development areas in communities are getting scarce, and for the SHS Initiative all this offers opportunities, as its focus is on building, housing and living concepts and systems for transformation from single family housing to multi-story buildings and block of flats.

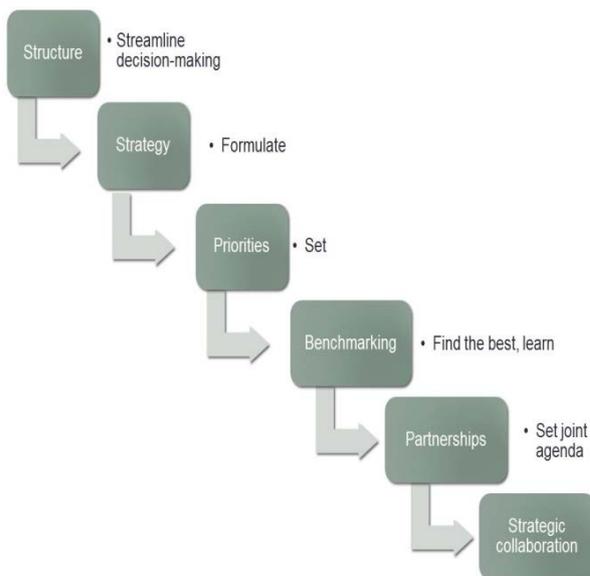
4.5 Recommendations

This report has praised the Initiative's visible achievement, flagged up some crucial challenges that will need to be tackled in the coming years and presented a number of suggestions and ideas to be considered. The main recommendations include priorities that require relatively short term actions. These include:

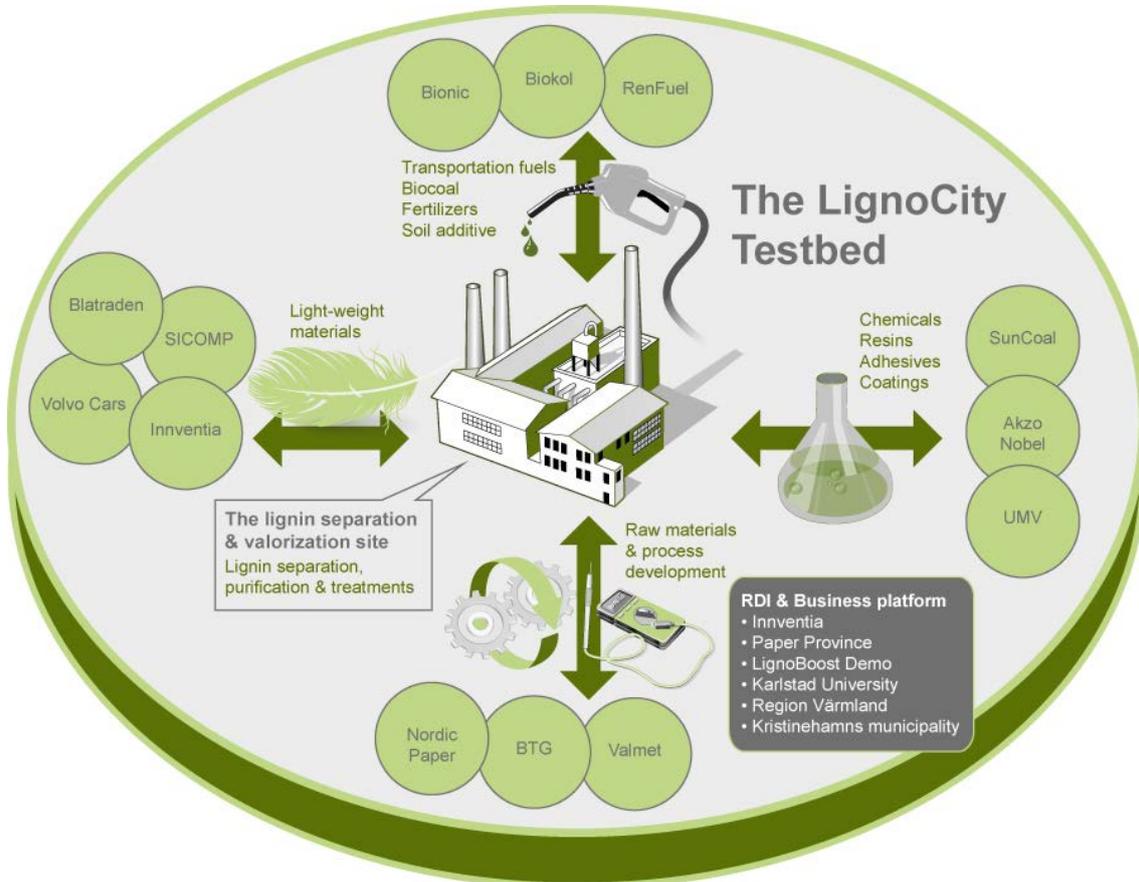
- **Focus and strategy.** SHS would benefit from focusing its scope and ambition and to design a strategy that includes clear goals and sub-goals.
- **Define what “smart” means for the SHS Initiative.** We would recommend the Board and the Management team to brainstorm what “smart” means specifically for SHS as a regional Initiative. This will enable the Initiative to manage the expectation of the three groups of stakeholders who will be not only explore their understanding of the term but more crucially align such understanding to the SHS Initiative. As SHS is moving on to build a national and an international profile, such clarity will be required by external partakers or collaborators. The international reputation and credibility of the Initiative will hinge on its strengths and ambitions.

- **Strengthen ‘architectural capacity’ in the Initiative.** To fully realise the transformational aspiration of SHS with respect to design and build sustainable housing made of wood and glass the innovation system would benefit from stronger architectural competences. This can be realised by linking up with Schools of Architecture in the country or internationally. The specialist evaluators see architects as crucial integrator designing solutions that merge wood and glass in totally creative new ways. The lack of competences that require creativity and ingenuity and imagination, might stop the cluster from realising its full potentials.
- **Ecological and social sustainability is timely.** This area is core to the EU Commission green agenda and this would enable the Initiative to connect with EU partners easily and meaningfully. Sustainability is very much tagged on both the EU structural funds and Horizon 2020 funds giving opportunities to both regional governments and universities to leverage the Initiative to attract additional funding.
- **Benchmarking.** SHS Initiative ought to carry out a benchmarking exercise to ascertain if there are other centre of expertise on sustainable housing, where they are and in what they would differ from SHS. This exercise should be truly international and beyond the EU.
- **Open up and connect nationally and internationally.** SHS would benefit from an increased intensity and breadth of linkages nationally and internationally. These will not only provide missing competences in architecture, design and new markets, but also valuable partners and precious customers. Nationally, SHS would benefit from connecting with other Vinnova Initiatives for instance in the VINNVÄXT programme, interesting synergies could emerge from exchanges with Geo Life Region on sensors for more energy efficient living; Biorefinery of the Future on possible bio-chemical construction products. Other Vinnova programmes would also provide extremely useful high tech competences in particular in relation to the Challenge Driven Innovation programme or the Strategic Innovation Area programme.
- **Issues for long term planning.** A roadmap highlighting what the Initiative might achieve in 5-10-15 year time could a valuable exercise to identify needs, constraints and challenges, as well as low-hanging-fruit ready to become quick success and on the other hand, harder to achieve but game changing accomplishments.

Figure 4. Recommendation "What to do next"



5 The Paper Province 2.0 (PP2.0)



The Ligno city testbed. From www.paperprovince.com/press

5.1 The Initiative

Paper Province 2.0 (PP2.0) aims to become “the leading competence node for the forest based bio-economy”. The core idea is to demonstrate the bio-economy in practice. PP2.0 has successfully mobilised all the main regional stakeholders mirroring the triple helix; universities, industries and government. Most of the leading firms, regional and local public actors as well as the Karlstad University (KaU) have committed themselves to the overall goals of the Initiative; striving for betterment of the region and better utilization of its core assets. The commitment has become more visible, particularly in the way the core ideas of the PP2.0 Initiative have been translated into a broader smart specialisation strategy of the Värmland Region.

5.2 Achievements and strengths

As mentioned above, the commitment among the regional stakeholders is impressive. Most of the relevant key actors share in both the vision and the ambitions of the main goals and activities of the Initiative.

There is visible trust between the management team and the board. Consequently, the management team has the freedom to act in the context of collectively agreed strategy.

PP2.0 has a very well established understanding of its core resource, namely wood. However, the brand itself – paper province – reflects history and the strong identity of the region. Consequently, outsiders might easily misinterpret the actual content of the Initiative, as the focus is not just on paper but also many other wood related products and processes. Indeed, as the region strives to become a leading international competence node for forest based bio-economy, the name fails to convey such aspirations.

The Initiative introduced the *Value Creation Forum* to brainstorm ideas, and the *Bioexpress* model to facilitate the idea-to-market concept. The internal mechanisms that have been used to assess innovations and market-test them have been argued to have facilitated the development of ideas and their translation in more marketable products.

5.3 Challenges and weaknesses

Despite its good start and the strong regional support, PP2.0 faces a number of challenges that will need to be tackled in the very near future.

Forest related products have for long been at the core of the Swedish economy: this has generated a sense of pride in this core resource and local strong and famous companies making use of them. This is a strength but also a challenge. The absence of the saw mills and solid wood manufacturers among the business stakeholders has been noticed; involving them would be beneficial – there are plenty of value added applications outside saw milling and solid wood manufacturing. The idea should be to search for novel opportunities and build industrial symbiosis where all streams are refined into maximum potential.

Despite its commitment, the university has a mix of competences and knowledge that is limited and needs to expand to provide the necessary research and innovation capabilities. Its areas of expertise relevant to the Initiative are chemical engineering and service business. However, crucial to understand innovation in packaging and future markets would be an understanding of e-commerce which at the moment is weaker than desirable.

In the era of demand and user-led innovation, the forest-based bio-economy is still pushed forward by new discoveries in science and engineering: demand and customers need to be created. The concept of end-value refers to the value of an innovation to its users. It can be difficult to gauge the end-values of new products and processes yet to be identified; but it is important to discuss the ways in which different societal groups may be affected by such developments (see for more Sotarauta et al 2016).

New innovations cannot penetrate economies without the emergence of new markets or changes in the existing ones: therefore understanding the dynamics of market formation is a crucial task for this Initiative that aims at creating new business opportunities. The PP2.0 Initiative must address competence building for entering emerging markets. Even though it is virtually impossible to influence the market formation from a single location, it is vitally important to

construct competences to monitor and understand market formation dynamics for seizing the opportunities when they emerge (Sotarauta et al 2016; Sotarauta & Heinonen 2016).

All this would be important, as in the field of bio-economy, the ‘customer imagination’ is not developed enough to demand new kinds of services and products, and the PP2.0 Initiative with the main industrial players and the service researchers might take a lead in creating new products, new markets with visible social and economic benefits.

5.4 Opportunities

The strong existing core of the PP2.0 seems to focus strongly on renewable materials and their processing solutions, including renewable packaging materials, tissue machinery, barrier coating solutions, hygiene and non-woven products, together with some new openings.

With the goal of further expanding these strengths, the following opportunities were identified by the evaluation team.

The core strengths of the region are in packaging and tissue areas. Building on these, the Initiative should focus more on this core strength and involve the end customer with regard to “novel/innovative packaging, smart barriers, and “green containers””.

Pursue possible openings in the area of renewable materials value chain, such as technical materials (filters, insulation etc.), textiles (non-woven) and bio-composites. These business areas are suitable for smaller companies and start-ups which might already be located in or recruited to the area.

During this time of national restructuring of forest sector innovation providers (RISE, Innventia, SP etc.) identify a "wish list" of roles and expertise that PP2.0 could add to its already considerable strengths.

To assess its Research, Development, Demonstration and Deployment process, the Initiative would benefit from carrying out a national and international SWOT analysis. Global partners/customers, such as Amazon, could be included in this assessment with the international scope of several of the member companies (i.e. StoraEnso, Valmet, etc.) likely proving to be a considerable asset in trying to involve these large, international customers in these deliberations.

The cluster has a unique concentration of producers, suppliers and consultants in the current and future packaging area. The cluster should use the Horizon 2020 program to identify a "lead project/process" that will establish its core focus and an international reputation.

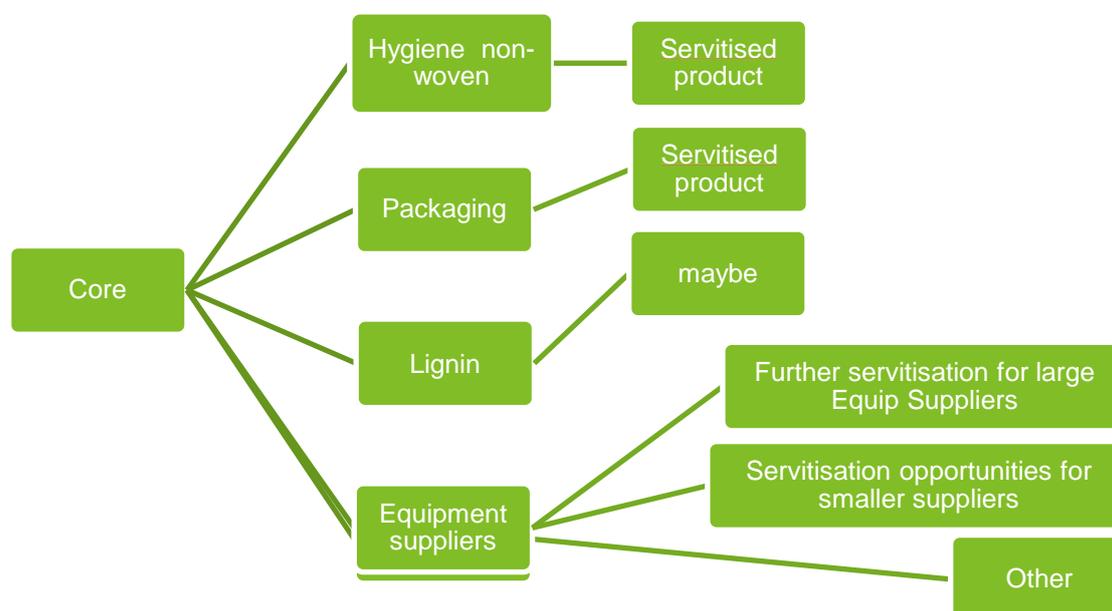
The Initiative has a waste and side stream “higher-value added” strategy and technological capacity built around with the Vinnova funded test bed for research and development of lignin (LignoCity). Equally valuable is the demonstration of biojet deployment and use at Karlstad airport, although receiving high international profile, there has been a tenuous link to current PP2.0 activities. However, a detailed benchmarking of biomass-to-biojet activities that are underway internationally should first be carried out before investing future resources in this area. This is one area where closer involvement of Karlstad University and the international community might prove beneficial.

In each of the waste-to-value projects it will be important to:

- Identify the industrial champions for each of the “waste and side streams” that will be studied commercialised
- Identify partnerships with companies who know the markets that these new products (carbon fibre, biojet, etc.) will be sold into
- Develop an early business plan for each product/process
- Benchmark the uniqueness/strengths of each project (i.e. LignoCity, Biojet, etc.) with what is going on internationally (CRIBE, Centre for Research and Innovation in the BioEconomy (<http://www.cribe.ca/>) (Thunder Bay, Ontario, Oslo Airport Bioport).

The Initiative has already started to explore avenues to servitised some of its products. This strategy should be further explored.

Figure 5. Opportunities to further explore for Paper Province 2.0



5.5 Recommendations

The evaluation panel would like to put forward a number of recommendations:

- **SWOT and benchmarking analyses.** SWOT analysis and a benchmarking/competitors’ analysis would be very valuable to identify and connect with national and international partners.
- **Funding streams.** To explore funding opportunities in the H2020, as well as to gain more visibility at the EU level to shape EU bio agenda (this can be done in a concerted way with the other initiatives tethered to the bio-economy platform)
- **Triple helix.** To expand competences of the university to match knowledge and innovation requirements coming from the industry and to leverage changes in innovation agenda in Sweden.

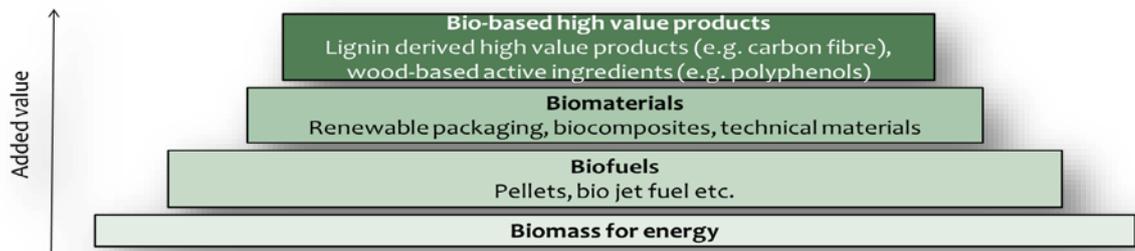
Increase resources at Karlstad University and make them even more of a critical player in high risk projects more appropriate for graduate student research (e.g. building Life Cycle Analysis capability).

With the recent addition of the local sawmills, is there an opportunity to develop projects more identified with this sector (i.e. “green” wood preservatives, lignin adhesives that can replace formaldehyde based glues, etc.)?

There is considerable potential to bring the sawmilling sector (and their core products and side streams) into the cluster focus. This will provide an opportunity to make it more of a Packaging, Tissue and Process Powerhouse (PTPP) rather than just a Paper Province (PP).

- **Promote a new generation of new small businesses.** The businesses opportunities explored by PP2.0 are very much conducive to the possibility of creating a new generation of new small businesses in the region. Indeed, the Initiative should maximize its efforts to connect with small businesses and start-ups to exploit new ideas and new markets in packaging, renewable materials, servitised products, business services. The presence of the BioExpress and incubating facilities should help in this respect. In this Initiative opportunities for commercialisation should be frequent and with relatively lower set up costs.
- **Carry out a foresight exercise.** The PP2.0 Initiative should reach beyond what there already is and what is easily identified, and stretch its exploration beyond the obvious and hunt for alternative uses of wood. PP2.0 is well positioned not only to demonstrate forest based bioeconomy but explore its limits. It should strengthen its capacity to think ‘out of the box’ by explicitly learning ways to enhance ‘bio-imagination’. This could be done by foresight processes and inviting skilled foresight professionals to help in finding new avenues.

Figure 6. Added value of forest based bio products



- **Towards bio-imagination.** The Initiative emphasizes strongly the need to create its bio-economy demand. It might benefit from developing specific competences to monitor and assess systematically the emergent bio industries. Future work on adding value to existing and future side/waste streams are detailed includes:
- **More focus.** It is recommended that the cluster considers focusing on more of its core strengths rather than the current focus on trying to add value to the waste/side streams associated with making the higher value, core products.

6 New Technologies: Industry 4.0 and Smart Industry

A wave of radically new technologies are emerging and for their disruptive nature they are referred to as contributing to the 4th industrial revolution (Marsh, 2012). These new technology will impact on all traditional manufacturing sectors and include biotechnologies, nanotechnologies, neurotechnologies, green & renewables, ICT & mobile tech, 3D, artificial intelligence, robotics, sensing, space tech and autonomous vehicles. A new manufacturing model that redefines the core competences and the processes of manufacturing activities is therefore emerging: when such technologies are applied to large firms, they are argued to shape a new organisation of production inside the factory model that is often referred to as Industry 4.0.

Industry 4.0 describes a smart factory as a new cyber-physical space underpinned by the new techno-economic paradigm. At the same time, the adoption of these new technologies is expected to change as well the way production is organised between firms – along the value chain- and will therefore interest as well small and medium sized firms, new firm formation and new entrepreneurial forms. A broader understanding of the impact of the fourth industrial revolution on production system and innovation systems will redesign a new **smart industry** sector.

This new Smart Industry is expected to blur the lines between sectors - especially between traditionally defined as manufacturing and services – and they will adopt new processes, identify new needs, create new markets, introduce new product and create new sectors. Such high tech products or services can only be targeted at high end markets; these can be untapped market niches for personalized, customized and innovative products. These need to be produced in small batches or even as unique pieces. Such niche markets require customers to co-innovate or even co-produce with the manufacturer or the maker. This contributes to a shortening of supply chains with suppliers and customers being co-located for denser outsourcing linkages.

An important value creation aspect of this new manufacturing model is the process of "**Servitisation**" that will affect many sectors. Servitisation changes the business model of manufacturing firms as well as the nature of their products. The product-service system is an integrated product and service offering whereby goods are bundled with services and offered as a service that delivers value in use and that is customized. Examples include Rolls-Royce which sells engines as a service, "power-by-the-hour"; or KONE that sells "vertical movements" rather than lifts. In other words it sells a package that bundles installation and maintenance with the physical object (see Institute for Manufacturing, University of Cambridge UK <http://www.ifm.eng.cam.ac.uk/research/service>). For more information, see <http://www.makers-rise.org>.

7 Conclusions

7.1 Triple Helix and system building

The three Initiatives have all shown that they have been able to mobilise the key stakeholders to activate a regionally based triple helix and thereby initiated the regional innovation system. The local and regional agencies have in all three cases shown strong engagement and commitment to their Initiative and this has already triggered a multiplier effect in the region. Examples of this is in Paper Province 2.0 where the cooperation between the research institute Innventia and Kristinehamn municipality led to the Vinnova funded test bed for lignin R&D, LignoCity, and the inclusion of the Paper Province 2.0 Initiative's core ideas in Region Värmland's smart specialisation strategy.

At the same time, we observed that in the three Initiatives more work needs to be done to balance contribution of each of the stakeholder groups by strengthening which of the helix might be less developed. In the Geo Life Region, for instance, the evaluators recommend that the University needs to be more engaging at an institutional level going beyond individual faculty's commitments; in Paper Province 2.0 the Karlstad University is very committed, however, the evaluators recommend to expand the mix of competences and knowledge to provide the local system with the necessary research and innovation capabilities.

The critical mass and the breadth of the business community also contribute to system building in the Initiatives. Following the leadership of larger local firms, new firms are expected to emerge to populate the local supplier chains and to take to market innovations and prototypes. It was noticed however that new firm formation is limited in all of the three Initiatives due to a lack of entrepreneurial culture in the regions –see the case of Paper Province 2.0 and Geo Life Region. This is of course not surprising since the Initiatives are aimed at re-casting the industrial make-up of the regions and to create innovative systems that whilst drawing on regions' industrial heritage, explore innovations and new technologies able to trigger growth opportunities. The role of the triple helix would be to contribute to create new business opportunities, new firms as well as to diversify existing businesses. It is therefore very important that the Initiatives put in place clear structures and processes to translate innovations into business openings: indeed to secure a route from prototype to product for all innovation coming out from the innovation activities in particular of universities or research organisations.

7.2 Focus and visibility

The three Initiatives have great ambitions to reshape the regional economies driving an inclusive process that sees key stakeholders coming together to align targets and means. This has meant that in this first period the Initiatives felt compelled to pursue a broad portfolio of activities and therefore to fund a variety of projects – some broadly related to the primary objective of the Initiatives. This has built consensus at the regional level, given ample visibility to the Initiatives and also created momentum across the triple helix stakeholders. However, as the Initiatives move onto the consolidation stage, the evaluators recommend more focus on to

what is the core ambition of the Initiatives, and this requires in some cases a reflection on what is the novelty of the Initiative and where the funding, energy and resources should be channeled to. In SHS, the evaluators for instance suggest reaching a clearer definition of ‘smart’ not to be pedantic but to crystallize what the transformative challenge of the Initiative is for internal purposes and – as the Initiative develops an international reputation. Benchmarking and foresight exercises will be strategically important in this respect to identify market potentials, crucial competitors and best-practice and roadmaps to action. The evaluators recommend this to all three initiatives.

7.3 Recommendations for long term planning

The longer term success of these three Initiatives will rest on the longevity of their clusters and the linkages between the three groups of stakeholders in each of them (regional and local governments, businesses and academia). The impact each Initiative will have on regional economy and jobs created will depend on their ability to grow, anchor itself in the regional economic fabric and mature during the period of Vinnväxt.

For the regional stakeholders, the Initiatives have a role to play way after the Vinnväxt funding will come to an end. For this to happen, the evaluators would advise the Board and the Management team in each of the Initiatives to start thinking about what form each Initiative will have to take to be a permanent catalysis in the regional economy and an innovation hub to stand national and international competition. This means managing the phasing out of Vinnväxt funding during the 10 years to ensure that as Vinnväxt funding decreases, other sources are ready to kick in to maintain a secure and adequate stream of funding. The destination of funding might also change as the Initiative moves from a set-up stage to a more mature and consolidated one.

A roadmap highlighting what each Initiative can look like in 5-10-15 year time could be a valuable exercise to identify desired results, needs, constraints and challenges. Also it would be helpful to identify projects that can demonstrate the competence and innovation capability of the Initiative by pursuing ‘low-hanging-fruits’ that can become quick successes to showcase. On the other hand, projects that are much more exploratory, risky, but which can deliver, nevertheless, game changing innovations, should be isolated and carefully evaluated.

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Appendix: The evaluation team

An international team of experts evaluated the VINNVÄXT initiatives. The team members were experts with:

- Academic and/or business-oriented profile with excellent state-of-the-art knowledge on innovative clusters and innovation systems
- Academic and/or business-oriented profile with excellent state-of-the-art knowledge in the specific field for the initiative.

The experts on clusters and innovation systems participating in the evaluation of all three initiatives were:

- *Prof. Lisa De Propris*, University of Birmingham. Her main research interests lie in studies of small firms and clusters, competitiveness in clusters and regions, forms of clusters and governance, innovation, clusters and foreign direct investment, regional development, knowledge economy and clusters and creative and cultural industries.
- *Prof. Markku Sotarauta*, University of Tampere, School of Management. He specialises in place leadership, innovation systems and institutional entrepreneurship in local and regional economic development.

The experts for the specific field of each initiative were:

Geo Life Region

- *Dr. Peter A Hecker*, CEO GEOkomm e.V., Berlin, Germany
- *Roya Ayazi*, Secretary General of NEREUS (Network of European Regions Using Space Technologies), Brussels, Belgium

Smart Housing Småland

- *Berit Time*, Centre director and chief scientist SFI Klima 2050, SINTEF Building and Infrastructure, Trondheim, Norway
- *Jan Belis*, Professor at Eindhoven University of Technology, Director for the Laboratory for Research on Structural Models at Ghent university and also Editor in Chief for the Glass Structures & Engineering journal

The Paper Province 2.0

- *Jack (John) N Saddler*, Professor and former dean of the Faculty of Forestry University of British Columbia, Vancouver, Canada. He is also Task Leader of the International Energy Agencies (IEA) Bio-energy Liquid Biofuels network. His research interests are within biotechnology and microbiology and range from the technical issues surrounding bioconversion of wood to fuels and chemicals, through to the political and economic ramifications that these technologies will have for our world.
- *Dr. Tiina Pursula*, Business Director Gaia Consulting Ltd., Helsingfors, Finland. Tiina is responsible for Gaia's consultancy services for process industry including resource efficiency improvement, bio and circular economy related business development and sustainability indicators and assessment.

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- 05 FFI Årsrapport 2015 - *Samverkan för stark svensk fordonsindustri och miljöanpassade samt säkra transporter*
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- 03 Googlemodellen - Företagsledning för kontinuerlig innovation i en föränderlig värld
- 04 Öppna data 2014 - Nulägesanalys
- 05 Institute Excellence Centres - IEC - En utvärdering av programmet
- 06 The many Faces of Implementation
- 07 Slututvärdering Innovationslössar inom hälso- och sjukvården

VR 2013:

- 01 Från eldsjälsvivna innovationer till innovativa organisationer - Hur utvecklar vi innovationskraften i offentlig verksamhet?
- 02 Second International Evaluation of the Berzeli Centra Programme
- 03 Uppfinningars betydelse för Sverige - Hur kan den svenska innovationskraften utvecklas och tas tillvara bättre?
- 04 Innovationslössar inom hälso- och sjukvården - Halvtidsutvärdering
- 05 Utvärdering av branschforskningsprogrammen för läkemedel, bioteknik och medicinteknik
- 06 Vad ska man ha ett land till? - Matchning av bosättning, arbete och produktion för tillväxt
- 07 Diffusion of Organisational Innovations - Learning from selected programmes
- 08 Second Evaluation of VINN Excellence Centres - BiMaC Innovation, BIOMATCELL, CESC, Chase, ECO2, Faste, FunMat, GigaHertz, HELIX, Hero-m, iPACK, Mobile Life, ProNova, SAMOT, SuMo & Wingquist
- 09 Förkommersiell upphandling - En handbok för att genomföra FoU-upphandlingar
- 10 Innovativa kommuner - Sammanfattning av lärdomar från åtta kommuner och relevant forskning
- 11 Design av offentliga tjänster - En förstudie av designbaserade ansatser
- 12 Erfarenheter av EU:s samarbetsprogram - JTI-IKT (ARTEMIS och ENIAC)

VR 2012:

- 01 Utvärdering av Strategiskt gruvforskningsprogram - Evaluation of the Swedish National Research Programme for the Mining Industry
- 02 Innovationsledning och kreativitet i svenska företag
- 03 Utvärdering av Strategiskt stålforskningsprogram för Sverige - Evaluation of the Swedish National Research Programme for the Steel Industry
- 04 Utvärdering av Branschforskningsprogram för IT & Telekom - Evaluation of the Swedish National Research Programme for IT and Telecom
- 05 Metautvärdering av svenska branschforskningsprogram - Meta-evaluation of Swedish Sectoral Research Programme
- 06 Utvärdering av kollektivtrafikens kunskapslyft
- 07 Mobilisering för innovation - Studie baserad på diskussioner med 10 koncernledare i ledande svenska företag
- 08 Promoting Innovation - Policies, Practices and Procedures
- 09 Bygginnovationers förutsättningar och effekter
- 10 Den innovativa vården
- 11 Framtidens personresor - Slutrapport. Dokumentation från slutkonferens hösten 2011 för programmet Framtidens personresor
- 12 Den kompetenta arbetsplatsen
- 13 Effektutvärdering av Produktionslyftet - Fas 1: 2007-2010



Vinnova - strengthening Sweden's innovativeness

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